

Chapter H6: Benefits Analysis for the J.R. Whiting Facility

This chapter presents the results of EPA's evaluation of the economic benefits associated with reductions in estimated I&E at the J.R. Whiting facility. The economic benefits that are reported here are based on the values presented in Chapters H4 and H5, and EPA's estimates of I&E at the facility with and without an impingement deterrent net in place (see Chapter H3). Section H6-1 summarizes the estimates of baseline economic loss developed in Chapters H4 and H5. Section H6-2 summarizes the economic

benefits attributable to the impingement deterrent net installed at the J.R. Whiting facility to reduce impingement. Section H6-3 discusses anticipated reductions in current I&E under the proposed regulation. Section H6-4 presents the estimated total economic benefit attributable to the regulation. Section H6-5 discusses the uncertainties in the analysis.

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H6-1 SUMMARY FIGURES OF BASELINE LOSSES

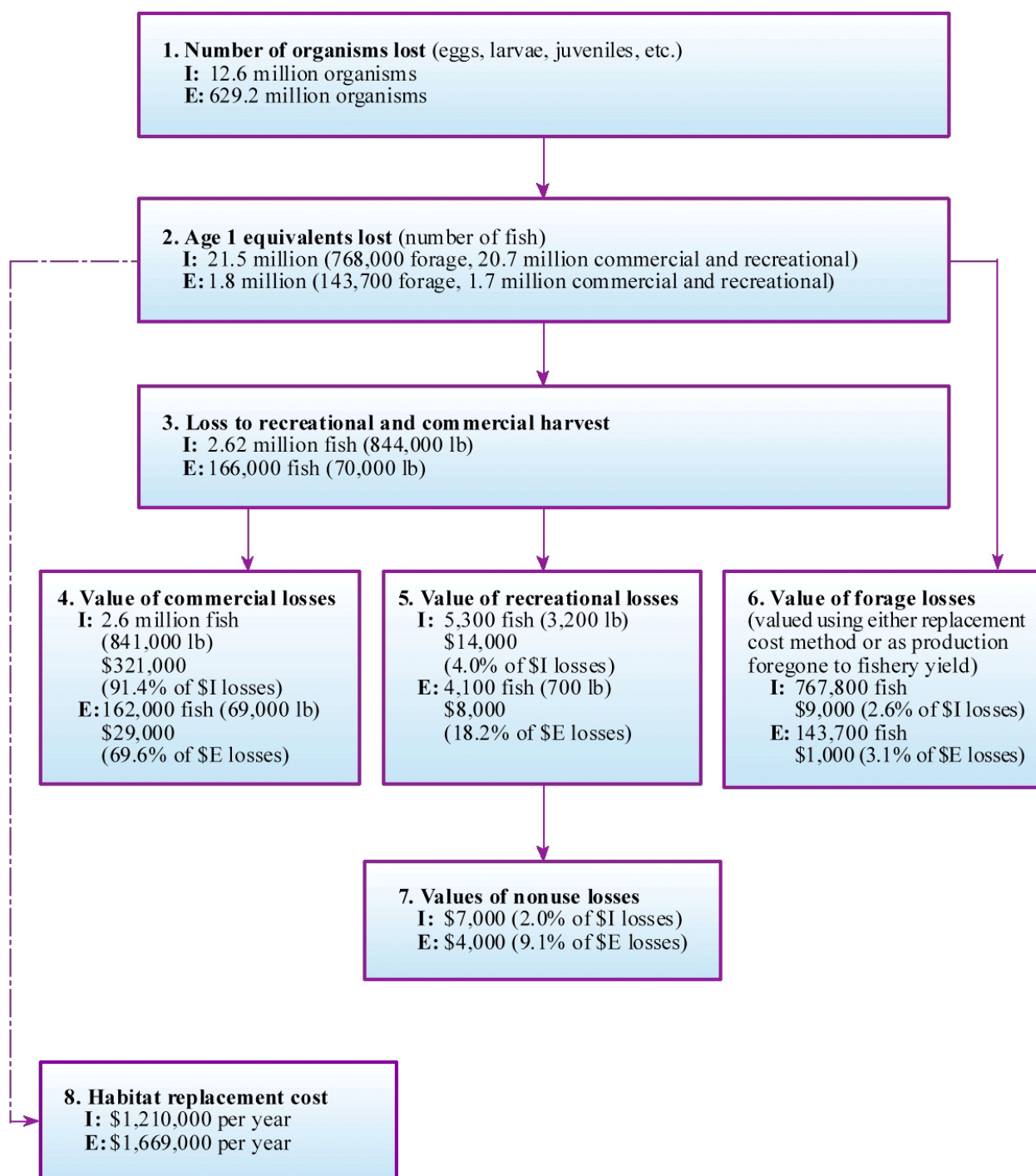
The flowchart in Figure H6-1 summarizes how the economic estimates for J.R. Whiting were derived from I&E estimates presented in Chapter H3. Figures H6-2 and H6-3 indicate the distribution of I&E losses by species category and associated economic values. These diagrams reflect the baseline losses without the net. All dollar values (and loss percents) reflect midpoints of the ranges for the categories of commercial, recreational, nonuse, and forage.

H6-2 BASELINE ECONOMIC LOSSES

Baseline economic losses due to I&E at the J.R. Whiting facility were calculated in Chapters H4 and H5. In Chapter H4, total economic loss was estimated using a benefits transfer approach to estimate the commercial, recreational, forage, and nonuse values of fish lost to I&E. This is a demand-driven approach, i.e., it focuses on the values that people place on fish. In Chapter H5, total economic loss was estimated by calculating the cost to increase fish populations using habitat restoration techniques (HRC approach). This is a supply-driven approach, i.e., it focuses on the costs associated with producing fish in natural habitats.

The total annual economic losses associated with each method are summarized in Table H6-1. These values range from \$351,000 to \$1,210,000 for impingement, and from \$41,000 to \$1,669,000 for entrainment. The range of economic loss is developed by taking the midpoint of the benefits transfer results and the 90th percentile species results from the HRC approach.

Figure H6-1: Overview and Summary of Average Annual I&E at J.R. Whiting Before Installation of the Impingement Deterrent Net and Associated Economic Values (all results are annualized)^{a,b}

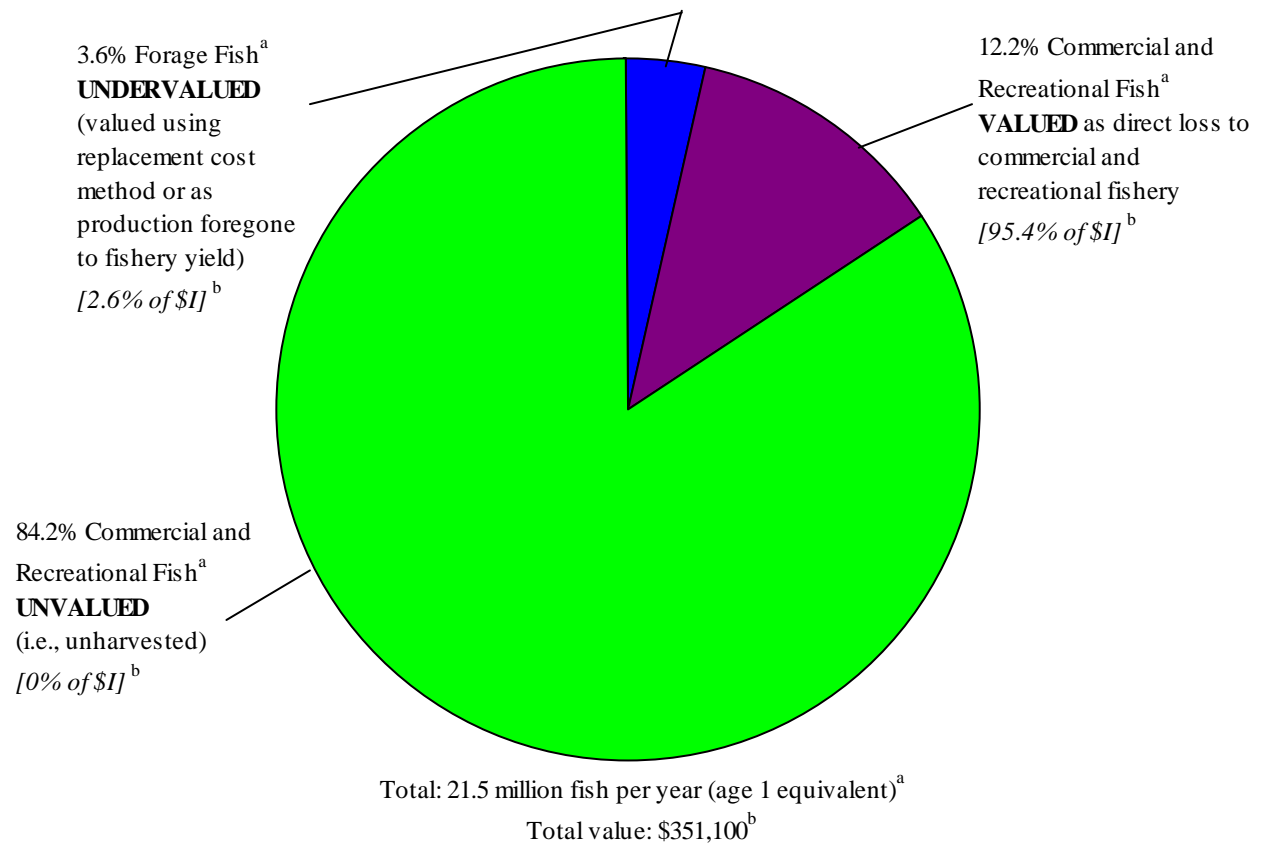


^a All dollar values are the midpoint of the range estimates.

^b I&E loss estimates are from Tables H4-2, H4-3, H4-9, and H4-10 in Chapter H4.

Note: Species with I&E <1% of the total I&E were not valued.

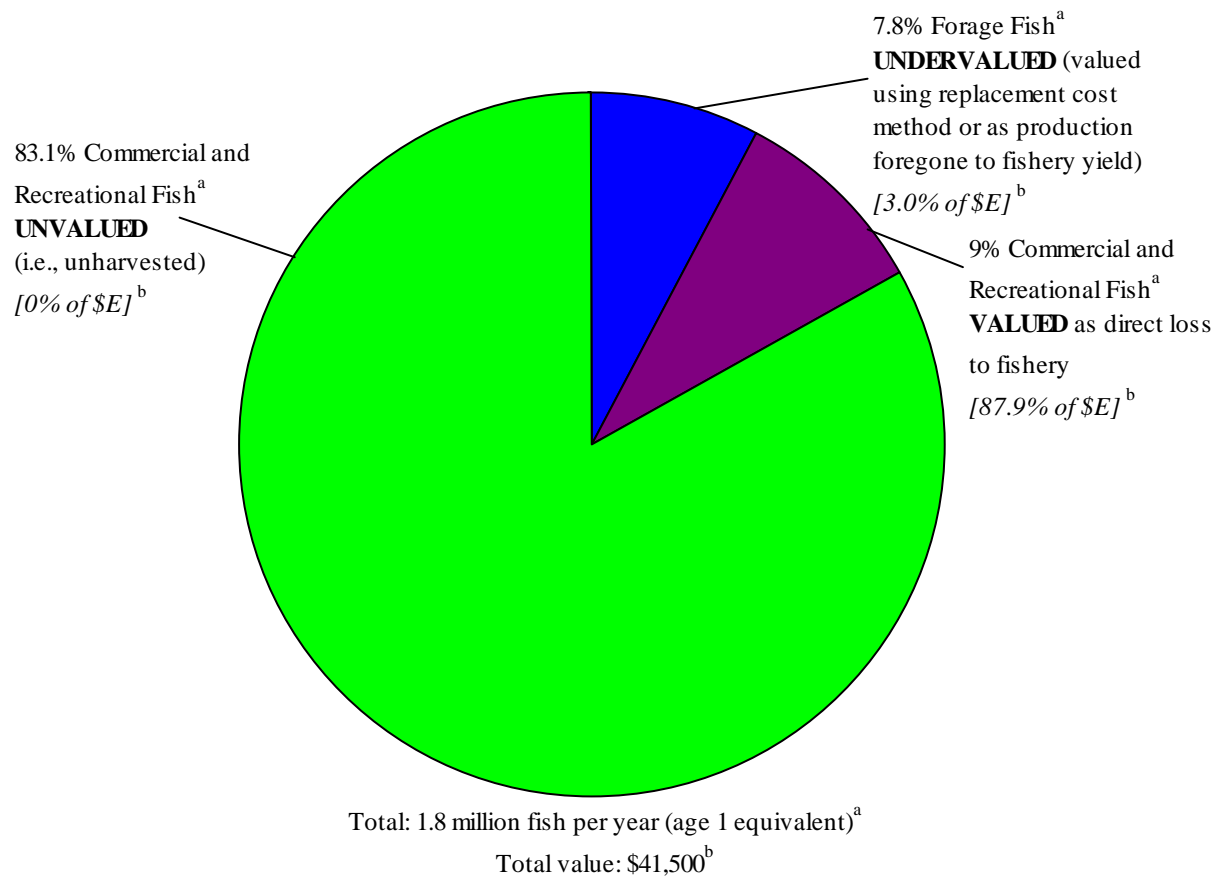
Figure H6-2: J.R. Whiting: Distribution of Impingement Losses by Species Category and Associated Economic Values



^a Impacts shown are to age 1 equivalents, except that impacts to the commercially and recreationally harvested fish include impacts to fish 2 or more years of age, depending on the age of entry into the fishery.

^b Midpoint of estimated range. Nonuse values are 2.0% of total estimated \$I loss.

Figure H6-3: J.R. Whiting: Distribution of Entrainment Losses by Species Category and Associated Economic Values



^a Impacts shown are to age 1 equivalents, except that impacts to the commercially and recreationally harvested fish include impacts to fish 2 or more years of age, depending on the age of entry into the fishery.

^b Midpoint of estimated range. Nonuse values are 9.1% of total estimated \$E loss.

Table H6-1: Total Baseline Economic Loss from I&E (2000\$, annually)

	Impingement	Entrainment
Benefits transfer approach (demand driven approach from Chapter H4) ^a	\$351,000	\$41,000
Habitat replacement cost approach (supply driven approach from Chapter H5) ^b	\$1,210,000	\$1,669,000
Range	\$351,000 to \$1.2 million	\$41,000 to \$1.7 million

^a Midpoint of Range from Chapter H4.

^b Based on cost to restore 90th percentile species impacted. Note that the lower bound estimates from the HRC approach reflect restoration of only half the impacted fish species (i.e., the 50th percentile). As such, the low end values for HRC were not considered in establishing the range of losses.

H6-3 ECONOMIC BENEFIT OF INSTALLING A BARRIER NET

In 1980, J.R. Whiting installed a deterrent net to reduce impingement at the facility. This dramatically reduced the number of fish impinged (from an average of 21.5 million age 1 equivalents per year to an average of 1.6 million per year). The total economic loss from impingement with the net installed is just 8 percent of the baseline value, or from \$28,000 to \$97,000 per year.

As summarized in Table H6-2, the total economic benefit of the J.R. Whiting net can be calculated by subtracting the total economic loss from impingement with the net installed from the baseline economic loss from impingement without the net. Thus, the economic benefits attributable to the net are \$323,000 to \$1.1 million per year.

The net does not appear to significantly affect entrainment at the site, so there are no entrainment benefits attributable to the net.

Table H6-2: Economic Benefits of J.R. Whiting Barrier Net

	Impingement Reduction (2000\$ annually)
Baseline economic loss	\$351,000 to \$1.2 million
Economic loss with net installed	\$28,000 to \$97,000
Total economic benefit of net	\$323,000 to \$1.1 million

H6-4 POTENTIAL ECONOMIC BENEFITS DUE TO REGULATION

The impingement deterrent net installed at the J.R. Whiting facility meets the requirements set forth in the proposed regulation for impingement reduction. Therefore, there are no anticipated reductions in impingement attributable to the regulation at this site. However, under the proposed regulation, J.R. Whiting would be required to take additional measures to reduce entrainment. Such measures could include the installation of fine mesh screens or using passive intake of cooling water. Table H6-3 summarizes the total annual benefits from entrainment reductions, under scenarios ranging from 10 percent to 90 percent reductions in entrainment. Table H6-4 considers the benefits of two options with varying percent reductions of I&E. Table H6-4 indicates that the benefits are expected to range from \$21,000 to \$835,000 for a 50 percent reduction in entrainment.

Table H6-3: Summary of Current Economic Losses and Benefits of a Range of Potential Entrainment Reductions at J.R. Whiting Facility (\$2000)

		Entrainment
Baseline losses	low	\$41,000
	high	\$1,670,000
Benefits of 10% reductions	low	\$4,000
	high	\$167,000
Benefits of 20% reductions	low	\$8,000
	high	\$334,000
Benefits of 30% reductions	low	\$12,000
	high	\$501,000
Benefits of 40% reductions	low	\$16,000
	high	\$668,000
Benefits of 50% reductions	low	\$21,000
	high	\$835,000
Benefits of 60% reductions	low	\$25,000
	high	\$1,002,000
Benefits of 70% reductions	low	\$29,000
	high	\$1,169,000
Benefits of 80% reductions	low	\$33,000
	high	\$1,336,000
Benefits of 90% reductions	low	\$37,000
	high	\$1,503,000

Table H6-4: Summary of Benefits of Potential Entrainment Reductions at J.R. Whiting Facility (\$2000)

		Entrainment
50% entrainment reduction	low	\$21,000
	high	\$835,000

H6-5 SUMMARY OF OMISSIONS, BIASES, AND UNCERTAINTIES IN THE BENEFITS ANALYSIS

Table H6-5 presents an overview of omissions, biases, and uncertainties in the benefits estimates. Factors with a negative impact on the benefits estimate bias the analysis downward, and therefore would raise the final estimate if they were properly accounted for.

Table H6-5: Omissions, Biases, and Uncertainties in the Benefits and HRC Estimates

Issue	Impact on Benefits Estimate	Comments
Long-term fish stock effects not considered	Understates benefits ^a	EPA assumed that the effects on stocks are the same each year, and that the higher fish kills would not have cumulatively greater impact.
Effect of interaction with other environmental stressors	Understates benefits ^a	EPA did not analyze how the yearly reductions in fish may make the stock more vulnerable to other environmental stressors. In addition, as water quality improves over time due to other watershed activities, the number of fish impacted by I&E may increase.
Recreation participation is held constant ^a	Understates benefits ^a	Recreational benefits only reflect anticipated increase in value per activity outing; increased levels of participation are omitted.
Boating, bird-watching, and other in-stream or near-water activities are omitted ^a	Understates benefits ^a	The only impact to recreation considered is fishing.
HRC monitoring program costs for wetland restoration not consistent with evaluating fish production/abundance	Understates benefits ^a	A monitoring program to determine wetland production/abundance of fish would be more labor intensive than current monitoring program
HRC based on capture data assumed to represent age 1 fish	Understates benefits ^a	High percent of less than age 1 fish observed in capture data, thereby leading to potential underestimate of scale of restoration required.
Effect of change in stocks on number of landings	Uncertain	EPA assumed a linear stock to harvest relationship (e.g., that a 13 percent change in stock would have a 13 percent change in landings); this may be low or high, depending on the condition of the stocks.
Nonuse benefits	Uncertain	EPA assumed that nonuse benefits are 50 percent of recreational angling benefits.
Recreation values for various geographic areas	Uncertain	Some recreational values used are from various regions beyond the Great Lakes.

^a Benefits would be greater than estimated if this factor were considered.